How to Use a Hand-Held Compass

Most people know that a compass does not necessarily point north, mainly because the north magnetic pole is now approximately at Ellef Ringnes Island in the Canadian Arctic, nearly a thousand miles from the north geographic pole, and moving several miles per year in a northwesterly direction. For various reasons such as local mineral bodies or magnetic anomalies, the compass may not even point exactly to the north magnetic pole. In the following discussion we call direction relative to the geographic north pole "true direction" and direction relative to the magnetic north pole "compass direction". The difference between true direction and compass direction we will call "variation" (sometimes called declination or deviation, but not by navigators, to whom deviation means error in the compass). Maps are available showing the variation, so if you know roughly where you are, it's not difficult to find true north from the reading of a good compass.

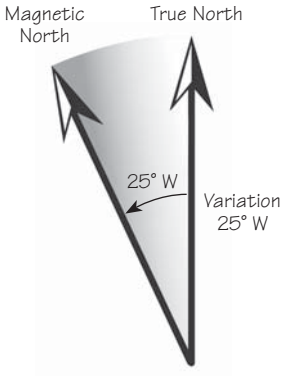

Figure 1: Variation.

Having said that, we should point out that this compass is not the one you'd choose for circumnavigating the earth. It's just a rugged handy instrument meant to keep you from getting lost when you're walking in unfamiliar territory. If you are using it to keep track of the direction you have been walking and intend to follow the same route back, just assume it points north and ignore variation.

Visit ngdc.coaa.gov/geomag-web/#declination or magnetic_declination.com to find the magnetic declination for your location. You can also establish variation by comparing the compass reading with what you know is north.

Your Compass

This compass is a hiker's compass. It is intended to be handy and rugged, but is not suited for taking exact bearings, as needed for precise location. For that it would need a base plate to align with map grid lines. However, it can do the job of setting you in the right direction and getting you home again.

As with any hand-held compass, there is one thing to remember. If you are holding the compass at waist level and looking down at it, and it seems to be pointing somewhere it shouldn't, check if there's a belt buckle, wristwatch, bracelet or other iron-based object near it. People have been lost because their compass needle was attracted to a large steel belt buckle more than to the earth's magnetic pole.

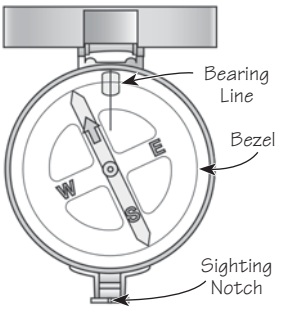

Figure 2: Compass showing true north and compass north with variation 30°W.

The needle is in theform of a cross with the cardinal directions marked as an arrow point for north, E for east, S for south, and W for west. It has a rotating bezel containing a clear protective plastic cover. In the cover is a small magnifying lens with a brass bearing line through it to aid in reading bearings with precision. The cover has a slot in it with a vertical sighting wire. At the other side of the compass is a sighting post with a lens for viewing the compass face and at the top of the sighting post is a small sight notch. When in use, the cover and the sighting post are set vertical. This notch and the sighting wire are aligned to determine a bearing or direction of travel.

Finding True North

Assuming that you know the variation for your general area, apply it to the compass reading to find the true direction it is pointing. Variation is shown on maps as E or W (east or west). We will use the convention that North is 0° or 360°, East is 90°, South is 180° and West is 270°. Navigators use a little verse to tell them whether to add or subtract the variation when applying it to the compass reading to get the true direction: "Variation east, compass least; variation west, compass best". That is, if your map tells you that local variation is 10°E, the compass reading will be 10° less than the true reading, so that when the compass says your direction is 100°, the true direction is 10° more, or 110°. Now suppose you want to establish which way is north from where you stand. Suppose also that local variation is 30°W. Rotate the bezel so that the sighting notch, the sighting wire and the bearing line are all lined up, with the bearing line at the side of the compass closest to the sighting wire. Hold your compass perfectly level, in a position such that you can sight through the notch at the wire. Rotate yourself and the compass until the bearing line is exactly 30° east (clockwise) from the north end of the needle. That will account for the variation. The needle will point to magnetic north and the line through the notch and the sighting wire defines true north.

Taking a Bearing

If you can see two landmarks that are on your map, you can take bearings on them to establish where you are.

Be sure the bezel with the bearing wire is lined up with the sighting notch and wire. Sight on the first landmark, aligning it with the sighting notch and the sighting wire. Looking through the sighting lens, read the bearing on the scale under the bearing line. Apply the local variation, adding east variation, subtracting west variation, to get the true bearing. For example, if the bearing is 45° (which is northeast), and the variation is 20°E, the true bearing would be 65°.

Repeat for the second landmark. On your map, draw each bearing backward from its landmark. Where those lines cross is your position.

Figure 4 shows an example. The mountain peak is at a true bearing of 260° and the river bend is at 160°. Cardinal directions are shown for reference.

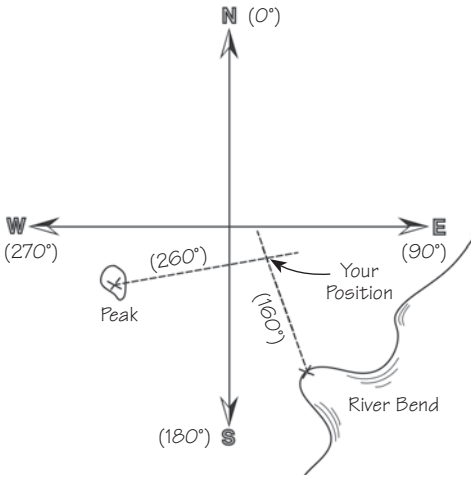

Figure 3: Plotted bearings.

The Mil Scale

You will see a scale from 0 to 64 around the edge of the compass dial. This is meant to represent the "millieme system". The scale, in which a circle is divided into 6238 milliradians (usually simplified by using 6400 instead), is used by many military organizations for estimating lateral distances when the range is known. We will not discuss it here, but mention it for those who wish to further investigate the compass's uses.

Orienteering

The foregoing gives only the most basic uses of the compass. To get the most from your instrument, you are advised to get a book on orienteering, or better, take a course. Then, with map and compass, you need never again fear getting lost.

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